United States Department of Agriculture • Forest Service

Northeastern Forest Experiment Station

Upper Darby, Pennsylvania
Ralph W. Marquis, Director

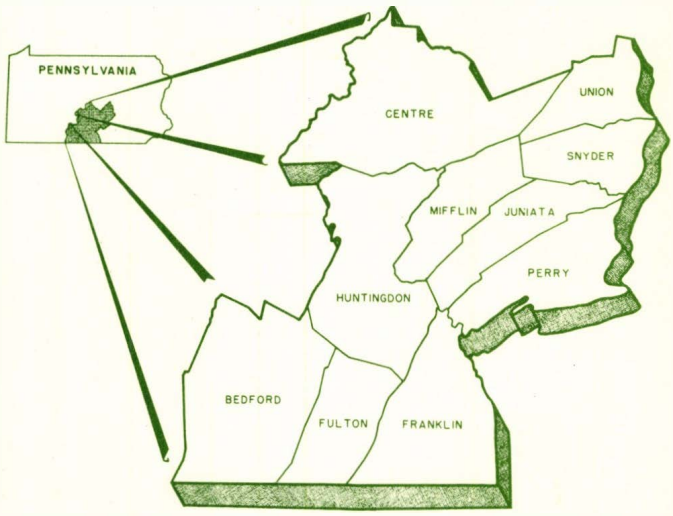
INTERMOUNTAIN STATION
Central Reference File
No. D, 73

Forest Statistics

for the

South-Central Section

of Pennsylvania



Forest Statistics Series
Pennsylvania No. 7

1956

FOREWORD

This is the seventh in a new series of reports about forest areas and timber volumes in Pennsylvania. It is a product of the Forest Survey of the Northeast, carried on by the Northeastern Forest Experiment Station as part of the nationwide survey being made by the Forest Service, U. S. Department of Agriculture.

The Pennsylvania State Planning Board provided the aerial photographs used in the survey. The Pennsylvania Department of Forests and Waters provided office space and gave other valuable assistance.

Field work in the South-Central Section of Pennsylvania was supervised by N. B. Griswold. The statistical procedures used were developed by C. Allen Bickford. Computations were made under the supervision of Roland H. Ferguson.

Ralph W. Marquis

RALPH W. MARQUIS
Director

CONTENTS

	Page
GENERAL	1
Forest area	2
Ownership	2
Forest types	3
Forest stands	3
Timber volume	3
Pulpwood volume	3
TABLES	
Land area	5
Commercial forest-land area	6
Timber volume	8
Average volume per acre	10
Pulpwood volume	10
APPENDIX	
Definitions of terms	11
Forest survey methods	14
Accuracy of the estimates	14
Species tallied	15

Forest Statistics

for the

South-Central Section

of Pennsylvania

Prepared By The

DIVISION OF FOREST ECONOMICS

Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture

GENERAL

THE SOUTH-CENTRAL SECTION of Pennsylvania is a ten-county area bounded on the south by the Maryland state line and on the east in part by the Susquehanna River. It includes Centre County (the geographical center of the State) and Bedford, Fulton, Franklin, Huntingdon, Mifflin, Juniata, Perry, Snyder, and Union Counties.

The land in this section is characterized by a series of mountain ridges that sweep in broad arcs from southwest to northeast. Some parts of this area are noted for their scenic beauties. There is Perry County, with a portion of the old Pennsylvania Canal; Union County, with Halfway State Park; and Bedford County, with one of the largest state parks, the Blue Knob.

There are only four cities of over 10,000 population in this section. The two largest are Chambersburg and State College, each with a little more than 17,000 inhabitants.

Natural resources of the South-Central Section are

mainly iron and bituminous coal in Centre, Huntingdon, Bedford, and Fulton Counties; limestone throughout most of the section; and agricultural land in the valleys and on the plateaus. The economy of most of the counties is based mostly upon agriculture. Dairying is the principal type of agriculture in Centre, Fulton, and Mifflin Counties. About 40 percent of the land area in Franklin and Snyder Counties is classified as cropland. All but one of these counties (Franklin) have more than 50 percent of their land area in forests.

Forest Area

The total land area in the South-Central Section amounts to almost 4 million acres. More than 60 percent of this--2,432,000 acres--is forest land. Fifteen thousand acres of the total forest area are reserved from timber cutting; this is mainly within State Parks and State Forest Monuments. Four of the State Parks (Black Moshannon, Caledonia, Blue Knob, and Cowans Gap) have more than 1,000 acres each of forest land reserved from timber cutting.

Two of the counties, Centre and Huntingdon, have about 70 percent of their land area in forests. Most of the other counties average about 60 percent, and only Franklin County has less than 40 percent of its land area in forests. Every county in this section has 100,000 or more acres of forest land.

Ownership

The second-heaviest concentration of State-owned forest land in the State is in this area. (The heaviest concentration is in the North-Central Section.) The Commonwealth owns a little more than 600,000 acres of forest land, one-fourth of all the commercial forest-land area, some in each of the ten counties. About 467,000 acres are in State Forests, and more than 129,000 acres are in State Game Lands. Another 12,000 acres of commercial forest land is administered by various State institutions. Federal, county, and municipal forest acreages are small, amounting to about 15,000 acres altogether, or a little less than 1 percent.

Of the privately-owned forest land (74 percent of the total), farmers own more than one-third, or almost 700,000 acres. Most of the remainder--1,095,000 acres--is held by numerous small private owners. There are no large private forest holdings of more than 5,000 acres in this area.

Forest Types

Hardwood forest types occupy 90 percent of the commercial forest-land area. The oak types (red oak, chestnut oak, white oak, and oak-pine) account for 84 percent of the total, and other hardwood types (principally sugar maple-beech-yellow birch, aspen, and ash-elm-maple) make up 6 percent. Three-fourths of the acreage in softwood types is made up of the pitch pine-Virginia pine and hard pine-oak forest types.

Forest Stands

Sawtimber stands occupy a little more than one-fourth of the commercial forest land. However, sawtimber stands of more than 5,000 board feet per acre occupy only 5 percent of the forest area and yet carry more than one-fourth of the total board-foot volume.

Approximately one-half of the forest-land area is in poletimber stands. About one-fifth is in seedling-and-sapling stands and nonstocked forest areas, which have little or no growing stock and will not produce a commercial timber crop for many years.

Timber Volume

Growing stock on the commercial forest land amounts to 1,805 million cubic feet. Of this, 929 million--a little more than half--are in sawtimber trees; and 876 million are in poletimber trees.

Included in this growing stock are three and a half billion board feet (log scale, International $\frac{1}{4}$-inch rule) of sawtimber. Oak species alone make up more than 70 percent of the total board-foot volume. More than 40 percent of the other hardwood board-foot volume is found in hickory and red maple. The softwood species, mostly white pine and hemlock, make up 12 percent of the total.

Pulpwood Volume

According to pulpwood specifications developed by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association, practically all of the growing stock is suitable for use by the pulpwood industry--including some large sawlogs and veneer-log material. In terms of these specifications, there are almost 21 million rough standard cords of pulpwood bolts.

Hardwood species account for 90 percent of the total volume suitable for pulpwood. A little more than a tenth of the hardwood pulpwood is in the "soft" hardwood species--principally red maple, basswood, aspen, and sweetgum. Coniferous species make up only 10 percent of the volume suitable for pulpwood.

Pulpwood stands averaging more than 5 cords per acre cover 70 percent of the commercial forest land. Of this, one-fourth carries more than 15 cords per acre. The remaining 30 percent of the forest area is made up of land having no pulpwood volume and other areas with pulpwood volume ranging up to 5 cords per acre.

Table 1.--Land area by major classes, 1954

Class of land[1]	Area	
	Acres	Percent
Forest land:		
Commercial	2,416,400	61
Noncommercial[2]	15,300	(3/)
All forest land	2,431,700	61
Nonforest land	1,556,100	39
All land[4]	3,987,800	100

[1] See Appendix for definitions.

[2] Includes 14,000 acres in State Parks and 1,100 acres in State Forest Monuments reserved from timber cutting.

[3] Less than 1 percent.

[4] Census of Agriculture, 1950. Water areas of 1 to 40 acres are included in the estimate of nonforest acreage.

Table 2.--Land area and commercial forest-land area by county, 1954

County	Land area	Commercial forest-land area	
	Acres	Acres	Percent
Bedford	651,500	388,700	60
Centre	713,600	492,400	69
Franklin	482,600	184,700	38
Fulton	278,400	178,200	64
Huntingdon	572,100	404,700	71
Juniata	247,700	146,300	59
Mifflin	275,800	172,700	63
Perry	352,000	213,500	61
Snyder	210,600	126,200	60
Union	203,500	109,000	54
All	3,987,800	2,416,400	61

Table 3.--Commercial forest-land area by ownership, 1954

Ownership class	Acreage held	
	Acres	Percent
Private:		
Farm forest land[1]	698,700	29
Other private	1,095,100	45
Total private	1,793,800	74
Public:		
State[2]	608,000	26
County	8,500	(3/)
Federal	4,800	(3/)
Municipal	1,300	(3/)
Total public	622,600	26
All ownerships	2,416,400	100

[1]Census of Agriculture, 1950.

[2]Includes 466,700 acres of State Forest Lands and 129,600 acres of State Game Lands.

[3]Less than 1 percent.

Table 4.--Commercial forest-land area by forest type, 1954

Forest type	Area	
	Acres	Percent
Red oak	891,200	37
Chestnut oak	862,700	36
White oak	198,900	8
Other oak types	60,500	3
Sugar maple-beech-yellow birch	56,900	2
Other hardwood types[1]	99,400	4
Pitch pine-Virginia pine	126,200	5
Hard pine-oak	55,100	2
Hemlock	42,400	2
Other softwood types	23,100	1
All types	2,416,400	100

[1]Includes 36,200 acres of aspen-gray birch type and 32,400 acres of ash-elm-maple type.

Table 5.--Commercial forest-land area by forest-type group and stand-size class, 1954

Forest-type group	Saw-timber stands	Pole-timber stands	Seedling-and-sapling stands and other areas	Total area
	Acres	Acres	Acres	Acres
Red oak	284,100	429,500	177,600	891,200
Chestnut oak	191,300	532,700	138,700	862,700
Other hardwood types	152,200	181,600	81,900	415,700
Softwood types	57,700	85,800	103,300	246,800
All types	685,300	1,229,600	501,500	2,416,400
Percent	28	51	21	100

Table 6.--Commercial forest-land area by stand-size class and drainage area, 1954

Stand-size class	Drainage area		Total
	Susquehanna River	Potomac River	
	Acres	Acres	Acres
Sawtimber stands:			
More than 5,000 board feet per acre	92,500	35,600	128,100
1,500 to 5,000 board feet per acre	431,300	125,900	557,200
Poletimber stands:			
More than 600 cubic feet per acre	491,800	66,100	557,900
200 to 600 cubic feet per acre	612,100	59,600	671,700
Other areas[1]	433,900	67,600	501,500
Total	2,061,600	354,800	2,416,400
Percent	85	15	100

[1]Includes 472,900 acres in seedling-and-sapling stands.

SOUTH-CENTRAL SECTION OF PENNSYLVANIA

Table 7.--Net volume of live timber on commercial forest land by species, 1954

Species	Growing stock[1]	Sawtimber[2]	Suitable for pulpwood[3]
	Thousand cu.ft.	Thousand bd.ft.	Thousand cords
White pine	52,200	174,700	620
Virginia pine	38,300	81,900	455
Hemlock	37,300	95,300	443
Pitch pine	32,300	70,800	383
Other softwoods	7,500	900	90
All softwoods	167,600	423,600	1,991
Chestnut oak	540,200	840,200	6,186
Red oak	400,200	907,300	4,583
White oak	187,000	448,800	2,141
Black oak	108,400	244,800	1,241
Red maple	94,300	103,700	1,079
Hickory	65,800	149,300	754
Sweet birch	34,700	44,200	397
Basswood	23,400	45,500	268
Ash	22,700	55,800	260
Sugar maple	21,900	27,600	251
Scarlet oak	19,800	44,600	227
Other soft hardwoods	70,400	101,200	806
Other hard hardwoods	48,900	92,900	561
All hardwoods	1,637,700	3,105,900	18,754
All species	1,805,300	3,529,500	20,745

[1] See Appendix for definitions. Growing stock includes pulpwood and sawtimber.

[2] Log scale, International ¼-inch rule.

[3] 4-foot bolts, including bark.

Table 8.--Net volume of live timber on commercial forest land by diameter class, 1954

Diameter class[1] (in inches at breast height)	Growing stock	Saw-timber
	Thousand cu.ft.	Thousand bd.ft.
Softwoods:		
6	21,700	--
8	28,800	--
10	37,300	113,900
12	33,600	120,300
14	18,100	71,400
16	12,500	51,600
18 +	15,600	66,400
All softwoods	167,600	423,600
Hardwoods		
6	239,800	--
8	279,300	--
10	306,400	--
12	247,100	788,800
14	206,200	797,900
16	121,000	488,400
18	84,800	344,000
20	47,700	203,000
22	43,400	187,800
24	30,100	140,400
26 +	31,900	155,600
All hardwoods	1,637,700	3,105,900
Total	1,805,300	3,529,500

[1]The midpoint of each 2-inch diameter class is indicated.

Table 9.--Net volume of live timber on commercial forest land by forest type, 1954

Forest type	Growing stock	Saw-timber	Suitable for pulpwood
	Thousand cu.ft.	Thousand bd.ft.	Thousand cords
Chestnut oak	681,300	1,162,200	7,829
Red oak	677,600	1,377,600	7,786
White oak	182,100	447,100	2,093
Other oak types	67,700	198,000	778
Other hardwood types	65,600	97,400	754
Hemlock	44,000	93,000	506
Pitch pine-Virginia pine	36,400	77,900	418
Other softwood types	50,600	76,300	581
All types	1,805,300	3,529,500	20,745

Table 10.--Average net volume of live timber per acre of commercial forest land, by stand-size class, 1954

Stand-size class (and acreage of each class)	Growing stock	Sawtimber
	Cubic feet	Board feet
Sawtimber stands:		
More than 5,000 bd.ft. per acre (128,100 acres)	2,000	7,300
1,500 to 5,000 bd.ft. per acre (557,200 acres)	1,200	2,900
Poletimber stands:		
More than 600 cu.ft. per acre (557,900 acres)	900	900
200 to 600 cu.ft. per acre (671,700 acres)	500	600
Other[1] (501,500 acres)	100	100
Average, all classes[2] (2,416,400 acres)	700	1,500

[1]Includes seedling-and-sapling stands and non-stocked areas.

[2]Hardwoods constitute 91 percent of the total growing stock or 88 percent of the total sawtimber volume. The average cubic volume of the total commercial forest area is equivalent to 9 cords per acre.

Table 11.--Area and volume by pulpwood volume-per-acre class, 1954

Pulpwood class	Area	Volume
	Thousand acres	Thousand cords
Less than 5 cords per acre	734	1,364
5 to 15 cords per acre	1,244	11,165
More than 15 cords per acre	438	8,216
Total	2,416	20,745

APPENDIX

DEFINITIONS OF TERMS

Forest Area

Forest-land area.--Includes (a) lands that are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which has not been developed for other use; and (c) afforested areas. (Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10 percent stocked are excluded.)

Commercial forest-land area.--Forest land that is (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber), (b) economically available now or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest-land area.--Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions.

Forest Types

Forest types are classified according to the species or species group that accounts for the major portion of the stand in terms of cubic feet in sawtimber and poletimber stands, or the number of stems in seedling-and-sapling stands.

Stand-Size Classes

Sawtimber stands.--Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International $\frac{1}{4}$-inch rule.

Poletimber stands.--Stands failing to meet the sawtimber stand specification, but at least 10 percent stocked

with poletimber and larger (5.0 inches and larger) trees, and with at least half the minimum stocking in poletimber trees. (Poletimber stands carry at least 200 cubic feet per acre.)

Seedling-and-sapling stands.--Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of commercial species and with at least half the minimum stocking in seedling-and-sapling trees.

Other areas.--Forest-land areas not qualifying as sawtimber, poletimber, or seedling-and-sapling stands. (Includes nonstocked areas.)

Tree Classes

Sawtimber trees.--Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and that are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches. (All butt sawlogs are considered merchantable. Where the butt is defective, upper sawlogs are considered merchantable if they account--in terms of aggregate net volume--for 50 percent or more of the gross volume below the top of the uppermost sawlog. Softwood sawlogs are at least 6.0 inches in diameter inside bark at small end; 8 to 16 feet in length; sound and straight enough to be manufactured into standard lumber. The smaller logs are generally free of surface defects other than small tight knots. Hardwood sawlogs are at least 8.0 inches in diameter inside bark at small end; 8 to 16 feet in length; suitable for sawing into standard lumber, construction timbers, or ties.)

Poletimber trees.--Trees 5.0 inches d.b.h. and larger of commercial species that do not meet the specifications for sawtimber trees but do meet regional specifications of species, soundness, and freedom from defect. (These are the trees that are straight and clear enough to make sawtimber trees eventually.)

Seedling-and-sapling trees.--Trees of commercial species less than 5.0 inches in diameter at breast height.

Cull trees.--Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species.

Timber Volume

Growing stock.--Net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Live sawtimber volume.--Net volume in board feet, International ¼-inch rule, of live sawtimber trees.

Pulpwood.--Net volume in rough, standard cords (bark included) of growing stock, excluding sound defect as well as unsound defect.

Pulpwood Volume

The pulpwood specifications used in this report are those set up by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association.

Pulpwood trees.--Live trees of commercial species, 5.0 inches d.b.h. and larger, containing at least two contiguous pulpwood bolts and with 50 percent or more of the main stem volume usable for pulp. (A merchantable pulpwood bolt is a section of the main stem of a pulpwood tree, 4 feet long; 4.0 inches or larger inside bark at the small end; free from any indication of rot, charred wood, metal or hollow center; and contiguous to one or more sections meeting these same requirements. Crotches are excluded; sweep or crook in any section shall exclude the bolt if a line from the center of the top cut to the center of the bottom cut passes outside the wood at any point. Most of the sawtimber and poletimber trees are also defined as pulpwood trees.)

Pulpwood volume.--Net volume in standard cords (including bark), of the main stem of pulpwood trees, from the stump to a point where the top breaks up into branches, or to a minimum top diameter of 4.0 inches (inside bark). Deductions are made for all portions of the stem that fail to meet pulpwood bolt requirements.

Pulpwood Stands

Less than 5 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of less than 400 cubic feet. (Includes seedling-and-sapling stands and nonstocked areas.)

5 to 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre ranging from 400 to 1,200 cubic feet.

More than 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of more than 1,200 cubic feet.

FOREST SURVEY METHODS

These forest statistics are based on information gathered from aerial photographs and from sample plots examined on the ground.

First, photo-interpretation plots were marked off on the aerial photographs. These plots were distributed uniformly by mechanical means over photographs of the entire district. Trained photo-interpreters then classified each photo-plot as either forest or nonforest. Forest plots were classified further according to stand-size and forest type.

Field crews inspected some of the photo-plots on the ground. Enough plots were selected at random so as to attain a specified level of statistical accuracy. Species and volume data were collected on these ground plots; and the photo classification of stand size and forest type was verified or--if necessary--changed.

The survey was designed for maximum efficiency in estimating total cubic volume to meet the national standards of accuracy.

ACCURACY OF THE ESTIMATES

The estimates in this report may contain two kinds of error. First, photo-interpreters may make mistakes of judgment and fieldmen may make mistakes in measuring or recording. There is no practical way of finding out just how often such errors occur. But they are kept to a minimum by closely checking all phases of the work.

The second kind of error is associated with sampling procedures. The size of this sampling error can be measured. In the South-Central Section of Pennsylvania the probabilities are 2 out of 3 that the actual forest area is within $\pm$ 2.2 percent of the estimated forest area, that the actual cubic-foot volume is within $\pm$ 3.6 percent of the estimated cubic-foot volume, and that the actual board-foot volume is within $\pm$ 6.5 percent of the estimated board-foot volume. This does not include any mistakes in measurement or classification.

These percentages show that the area estimates are more accurate than the volume estimates, and that the cubic-

foot estimates are more accurate than the board-foot estimates.

In each of the tables, the total figures are more accurate than the subtotals. The subtotals are more accurate than any of the individual figures. Figures that are small in relation to totals are subject to larger sampling errors.

SPECIES TALLIED

The various commercial tree species tallied in the South-Central Section of Pennsylvania are listed below. Approved common names[1] are shown in parentheses if they differ from the brief name used in the tables. Other tree species may occur in the area, but unless they were tallied on the field plots they were not included in the following list.

Softwoods

White pine (Eastern white pine)	- Pinus strobus
Virginia pine	- Pinus virginiana
Hemlock (Eastern hemlock)	- Tsuga canadensis
Pitch pine	- Pinus rigida
Other softwoods	
(Red pine)	- Pinus resinosa
(Northern white-cedar)	- Thuja occidentalis
(Table mountain pine)	- Pinus pungens

Soft Hardwoods

Red maple	- Acer rubrum
Basswood (American basswood)	- Tilia americana
Other soft hardwoods	
(Aspen)	- Populus species
(Sweetgum)	- Liquidambar styraciflua
(Yellow-poplar)	- Liriodendron tulipifera
(Elm)	- Ulmus species
(Black cherry)	- Prunus serotina
(Cucumbertree)	- Magnolia acuminata
(Black tupelo)	- Nyssa sylvatica
(Butternut)	- Juglans cinerea
(Paper birch)	- Betula papyrifera

[1]Little, Elbert L., Jr. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dept. Agr., Agr. Handb. 41. 472 pp. 1953.

Hard Hardwoods

Chestnut oak	- Quercus prinus
Northern red oak	- Quercus rubra
White oak	- Quercus alba
Black oak	- Quercus velutina
Hickory	- Carya species
Sweet birch	- Betula lenta
Ash	- Fraxinus species
Sugar maple	- Acer saccharum
Scarlet oak	- Quercus coccinea
Other hard hardwoods	
(Black locust)	- Robinia pseudoacacia
(Pin oak)	- Quercus palustris
(Yellow birch)	- Betula alleghaniensis
(Bur oak)	- Quercus macrocarpa
(American beech)	- Fagus grandifolia
(Black walnut)	- Juglans nigra
(Swamp white oak)	- Quercus bicolor
(Flowering dogwood)	- Cornus florida

AGRICULTURE-FOREST SERVICE-UPPER DARBY